Actions that would help protect and restore seasonal wetland habitat plant communities are contained in the Vision for Seasonal Wetland habitat.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

Efforts to restore seasonal wetland habitat plant communities would involve cooperation with other restoration programs, including:

- Upper Sacramento River Fisheries and Riparian Habitat Council,
- Suisun Marsh Protection Plan,
- California Department of Fish and Game wildlife areas,
- U.S. Fish and Wildlife Service refuges,
- Cosumnes River Preserve,
- Jepson Prairie Preserve,
- Solano County Farmland and Open Space Land Trust,
- Ducks Unlimited Valley Care Program,
- California Waterfowl Association,
- Cache Creek Corridor Restoration Plan,
- The Nature Conservancy,
- California Native Plant Society,
- Putah Creek South Fork Preserve,
- Woodbridge Ecological Reserve,
- Yolo County Habitat Conservation Plan,
- and Central Valley Habitat Joint Venture.

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

The seasonal wetland habitat plant community group is linked to other ecosystem elements in the ERPP Study Area. The seasonal wetland habitat plant community group includes vernal pools and seasonally flooded areas that support many species and communities of wildlife and plants. Seasonal wetland habitat plant communities are linked to primary and secondary physical processes including geomorphology, vegetation succession, overbank flooding, and floodplain inundation. Seasonal wetland habitat plant communities are linked to stressor elements including land use, non-native species, water management, and human disturbance. Seasonal wetland habitat plant communities are linked to habitat elements including vernal pool, seasonal wetland, and emergent wetland habitats. Links to wildlife elements include the greater sandhill crane, fresh emergent wetland wildlife guild, riparian wildlife guild, shorebird and wading bird guild, waterfowl guild, and native amphibians and reptiles. Vernal pool special-status plant species is also linked to seasonal wetland habitat plant communities.

OBJECTIVE, TARGETS, AND ACTIONS

The Strategic Objective is to enhance and/or conserve native biotic communities in the Bay-Delta estuary and its watershed.

SPECIES TARGETS: The target for all plant communities is to maintain the present distribution and abundance and ensure self-sustaining communities in the long-term.

LONG-TERM OBJECTIVES: Restore, protect and manage, throughout the watershed, multiple large areas of seasonal wetlands in association with other aquatic, wetlands, riparian, and perennial grassland habitat types in the Central Valley to a point where the needs of seasonal wetland associated plants such as Sanford's arrowhead and alkali heath are met and all at-risk species that depend on the habitat are no longer at risk.

SHORT-TERM OBJECTIVES: in the Bay-Delta, and begin implementation of action plans for restoring significant, large areas of seasonal wetland.

RATIONALE: Restoring seasonal wetlands in combination with other wetland and upland habitat types will help restore and maintain the ecological health of aquatic, terrestrial, and plant resources in the Delta and other areas of the Central Valley. Foodweb processes will be supported and the effects of contaminants reduced. Seasonal wetlands will provide high quality foraging and resting habitat for wintering waterfowl, greater sandhill cranes, and migratory and wintering shorebirds. Restoration of seasonal wetlands will occur as a by product of restoring floodplain

processes in a manner that improves spawning habitat for fish species such as splittail while avoiding concurrent increases in non-native predatory fish. Furthermore, restoring other wetland habitats in the Delta, such as tidal emergent wetland and tidal perennial aquatic habitat, can reduce habitat values for species such as waterfowl and the State listed greater sandhill crane. Increasing seasonal wetlands in the Delta will ensure that any adverse impacts associated with those habitat losses will be fully mitigated. Each habitat, including seasonal wetlands, supports a different assemblage of organisms and quite likely many of the invertebrates and plants are still unrecognized as endemic forms. Thus systematic protection of examples of the entire array of habitats in the region provides some assurance that rare and unusual aquatic organisms and rare plants will also be protected, preventing contentious endangered species listings.

STAGE 1 EXPECTATIONS: Several large seasonal wetland projects will have been initiated in the Delta. At least two of the projects will be associated with floodplain process restoration projects. At least two projects will be associated with restoring seasonal wetlands in heavily subsided areas where land elevations are too low to support actions to restore aquatic habitat. At least one project will be associated with expanding the vernal pool wetlands in the northeastern Suisun Marshlands and Bay Ecological Management Unit adjacent to the Yolo Basin Ecological Management Zone.

RESTORATION ACTIONS

Actions that would help protect, restore, and enhance seasonal wetlands are contained in the Vision for Seasonal Wetlands and as follows:

- implement existing restoration plans,
- expand public and private preserves and wildlife areas to create additional wetland complexes, including vernal pools and seasonally flooded areas,
- improve management of existing wetlands and restore seasonal wetlands on private lands,
- reconnect channelized streams and rivers to their historic floodplains,
- develop and implement alternative land use practices on public and private lands that will protect and improve vernal pools and seasonally flooded areas and allow existing, compatible land uses, such as seasonally-managed grazing, to continue,
- establish incentive programs to encourage landowners to establish and maintain seasonal wetlands, and
- develop vegetation management programs to enhance habitat value and reduce impacts from stressors such as introduced species.

INLAND DUNE HABITAT PLANT COMMUNITY GROUP

INTRODUCTION

Inland dune scrub is associated with inland sand dunes and is limited to the Delta in the vicinity of the Antioch Dunes Ecological Reserve. This habitat area supports two plant and one butterfly species listed as endangered under the federal Endangered Species Act. Major factors that limit this resource's contribution to the health of the Delta are related to adverse effects of sand mining, dune conversion to other land uses, dune stabilization, and land use practices that maintain the dominance of non-native plants.

RESOURCE DESCRIPTION

ANTIOCH DUNES. Inland dune scrub is localized in areas of wind-modified stream deposits in the south and western Delta. Inland dune scrub exists between Antioch and Oakley, south of Rio Vista, and on Brannan Island. Soil information indicates that the total inland sand-dune habitat within Contra Costa, Solano, and Sacramento Counties was historically less than 10,000 acres. Remaining habitat areas are being protected. Most protected inland dune scrub is located within the Antioch Dunes Ecological Reserve and Brannan Island State Park. These protected areas represent important, but small, relictual examples of this unique habitat.

The vegetation at Antioch Dunes consists of scattered forbs and grasses that form a ground canopy. Characteristic plant species include Antioch dunes evening-primrose (*Oenotherea deltoides* ssp. *howellii*), California croton (*Croton californicus*), California matchweed (*Gutierrezia californica*), Contra Costa wallflower (*Erysimum capitatum*), devil's-lettuce (*Amsinckia tesselata*), lessingia (*Lessingia glandulifera*), nude buckwheat (*Eriogonum nudum* var. *auricalataum*), and telegraph weed (*Heterotheca grandiflora*). Individual emergent shrubs or coast live oak (*Quercus agrifolia*) trees may be present over the ground canopy. The ground layer is generally open, and annual plants are seasonally present. The low nutrient conditions of the soils and natural instability of dune sands limit the amount of vegetation that establishes on the inland dunes.

Direct and indirect disturbances are reducing the extent and health of inland dune scrub habitat and its associated plants and animals. Sand mining directly removes habitat. Urban development has moved onto historical dune habitat and changed wind-flow patterns. Excessive foot traffic, off-road vehicle traffic, and grazing disturb dune surfaces, which makes dunes more susceptible to erosion. Application of herbicides, pesticides, and fertilizers change ecological processes that may encourage or support non-native species. Structures or activities that reduce or accelerate winds, wind-disturbances, or barriers to wind-driven sand movement disrupt the process that sustain dunes. Wind patterns blow river-deposited sand into shifting dunes. Shifting sand offers little stability for establishing plant root systems. Plant species characteristic of dunes survive within a disturbance threshold. Direct disturbances inhibit the ability of dune-associated plants to establish and result in loss of plant vigor or mortality. Sand movement barriers create conditions unfavorable for establishing native dune vegetation. These types of disturbances create site conditions conducive to establishing invasive weedy plants. Non-native weeds compete with native dunes plants and reduce overall habitat quality. Continued disturbance of potentially restorable adjacent habitat could interfere with protecting and restoring additional areas of high-quality habitat by affecting dune structure and destroying buckwheat which serves as foot for the Lange's metalmark, a federally listed as endangered species, as well as the federally listed Antioch dunes evening primrose and Contra Costa wallflower.

VISION

The vision for inland dune scrub habitat is to protect and enhance existing areas and restore former habitat areas.

Achieving this vision will provide high-quality habitat for associated special-status plant and animal populations.

Restoration of inland dune scrub would focus on protecting and improving important existing habitat areas. Historic inland dunes adjacent to existing ecological reserves in the Sacramento-San Joaquin Delta Ecological Management Zone would be reestablished. Protecting and restoring inland dune

scrub habitat would begin by identifying areas that are not currently managed for their resource values. Appropriate methods to protect and restore identified areas would be developed. Protected habitat areas would be evaluated to determine effective restoration management practices to increase habitat value. The results of these evaluations would determine how habitat would be protected and restored. For example, importing sand from areas proposed for development into low-quality areas proposed for restoration will provide important natural substrate that will increase the restoration potential. Management of the inland dune areas that are currently protected should focus on maintenance of the natural conditions to assure the natural dune ecosystem process is continued.

Reduction of stressors will be the key in establishing a long-term protection programs. In protected areas, management would include reducing human access to dune areas. Development of small boardwalks will reduce human disturbance in areas where recreational access or interpretive trails are needed. Access to the dunes by motorized or other vehicles would be prevented except as part of restoration and enhancement activities. Management activities would include exotic weed plant species removal and habitat enhancement to allow the establishment of native inland dune species. Use of herbicides, pesticides, and fertilizers would be eliminated except if it is necessary for specific non-native weedy plant species removal.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

Efforts to restore inland dune habitat will involve cooperation with programs managed by the Antioch Dunes National Wildlife Refuge. Cooperation from agencies with responsibility or authority for restoring inland dune habitat will be solicited. These include:

- California Department of Fish and Game,
- U.S. Fish and Wildlife Service,
- U.S. Army Corps of Engineers, and
- Delta Protection Commission.

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Inland dune scrub habitat is limited to the area near the Antioch Dunes Ecological Reserve. This type of habitat is important for two plant and one butterfly species listed as endangered under the federal Endangered Species Act.

It is adversely affected by human caused actions that contribute to erosion and spread of non-native species.

OBJECTIVE, TARGETS, AND ACTIONS

The Strategic Objective is to enhance and/or conserve native biotic communities in the Bay-Delta estuary and its watershed.

SPECIES TARGETS: The target for all plant communities is to maintain the present distribution and abundance and ensure self-sustaining communities in the long-term.

LONG-TERM OBJECTIVE: Protect, manage, and restore, on a self-sustaining basis, inland dune habitat in the vicinity of Antioch Dunes Ecological Reserve and the invertebrate and plants species that depend on this habitat.

SHORT-TERM OBJECTIVE: Improve or restore existing dune habitat within the Antioch Dunes Ecological Reserve and identify and conserve existing inland dune scrub habitat adjacent to the reserve.

RATIONALE: Inland dune scrub is associated with inland sand dunes and is limited to the vicinity of the Antioch Dunes National Wildlife Refuge. Major factors that limit this resource's contribution to the health of the Delta are related to adverse effects of sand mining, dune conversion to other land uses, dune stabilization, and land use practices that maintain the dominance of non-native plants. Two special-status plant species, the Antioch Dunes evening primrose and the Antioch Dunes wallflower, are found with inland dune scrub. The Lange's metalmark, a butterfly listed as endangered under the federal Endangered Species Act (ESA), is known only from the Antioch Dunes, where it feeds on naked buckwheat. The low nutrient conditions of the soils

and natural instability of dune sands limit the amount of vegetation that establishes on the inland dunes. The dunes represent a localized habitat that does not support other types of upland vegetation.

STAGE 1 EXPECTATIONS: The feasibility of reestablishing inland dune scrub habitat on historic dunes adjacent to the existing ecological reserve will have been completed. The most appropriate means to protect and restore identified areas adjacent to and within the reserve will have been completed and at least partially implemented. Small boardwalks will have been constructed to reduce human disturbance in areas where access or interpretive trails are required.

RESTORATION ACTIONS

Managing protected areas could include reducing disturbance of dunes and dune vegetation. This could be accomplished by reducing vehicle and pedestrian access to dune areas. Protective structures, such as small boardwalks could be built. These actions would reduce habitat disturbance while maintaining recreational access. The following actions would help restore inland dune habitat:

- remove barriers to wind-driven sand-dune movement to increase the area that would be available for natural expansion of the sand-dune base.
- import sands from areas being developed or clean sand dredged from Bay-Delta channels to increase restoration potential and dune area.
- control non-native weeds to recreate conditions suitable for reestablishment of native dune plants.
- reduce the use of herbicide, pesticides, and fertilizers that adversely effect native dune vegetation and wildlife.

Dune habitat protection and restoration strategies could be implemented through cooperative efforts with existing ecological reserves. Restoration efforts should focus on implementing existing protection and restoration programs, establishing cooperative agreements with land management agencies, and establishing conservation easements of purchasing land from willing sellers.

TIDAL RIPARIAN HABITAT PLANT COMMUNITY GROUP

INTRODUCTION

The tidally influenced shorelines of rivers and the Delta are often vegetated with woody riparian trees and shrubs. The structure of this riparian vegetation can be like that of a forest, woodland, or scrub or may be a mosaic of these formations. Riparian vegetation supports a great diversity of wildlife species and serves as important habitat for a variety of resident and migratory songbirds. Riparian vegetation also shades riverine aquatic habitat which is important habitat for many species of fish, waterfowl, and wildlife.

Major factors that limit these plant communities' contribution to the health of the Bay-Delta include historic riparian vegetation loss or degradation and nearshore aquatic habitat alteration from channelization, stabilization of channel banks with riprap, construction of levees, and control of flows.

Restoring riparian vegetation will involve reactivating or improving natural physical processes. Natural streamflows, stream meanders, and sediment transport create and sustain these vegetation types and increase the complexity and structural diversity of the habitat. Natural sources of gravel and other sediments along rivers and floodplains provide materials needed to create and sustain healthy riparian vegetation. Where improvements to physical processes do not adequately restore riparian vegetation, direct modification may be necessary to restore vegetation to its target acreage and quality.

A major increase in tidal riparian plant community groups will improve the foodweb and provide important habitat for threatened and endangered terrestrial wildlife species, such as the yellow-billed cuckoo and Swainson's hawk. More extensive and continuous riparian vegetation cover on along rivers and in the Delta will stabilize channels; help to shape submerged aquatic habitat structure; benefit the aquatic environment by contributing shade, overhead canopy, and instream cover for fish; and reduce local water temperatures. More extensive and continuous riparian vegetation associated with woody debris (branches and root wads) and leaf and insect drop in shallow aquatic habitats will increase the survival and health of juvenile salmonids and resident Delta native fish. Achieving this objective will also greatly enhance the scenic quality and recreational experience of the Delta and its waterways.

RESOURCE DESCRIPTIONS

Tidal riparian habitat includes several plant community groups. Environmental factors such as substrate, hydrology, and degree of salt water influence determine which plant community group will occur in a given area. The plant community groups that comprise tidal riparian habitat include black willow, sandbar willow, white alder, buttonbush, Mexican elderberry, and valley oak series.

Historically the Central Valley floor had approximately 922,000 acres of riparian vegetation (Katibah 1984) supported by a watershed of more than 40,000 square miles. Today, approximately 100,000 acres of riparian forest remain. About half of this riparian habitat is in a highly degraded condition, representing a decline of 90% (Katibah 1984). The Sacramento River once supported 500,000 acres of riparian forest; it now supports 10,000 - 15,000 acres, or just 2-3% of historic levels (McGill 1979, 1987). From about 1850 to the turn of the century, most of the forest was destroyed for fuel as a result of the Gold Rush and river navigation, and by large agricultural clearing. Additional clearing in the early and mid 1900s coincided with the aftermath of flood control reservoir and levee projects. These projects allowed for the clearing of floodplain riparian vegetation for orchards, crops, flood bypasses, and urban areas. Similar activities have occurred on the San Joaquin River and other rivers in the Central Valley.

Riparian areas along rivers within the Delta, and areas within the Delta itself, are influenced by the daily ebb and flow of the tide in the Pacific Ocean. Six distinct plant series are found within these tidal riparian areas: black willow series, narrowleaf willow series, white alder series, buttonbush series, Mexican elderberry series, and valley oak series. These six series are briefly described below:

BLACK WILLOW SERIES: In the black willow series black willow is the sole or dominant woody plant that forms a forest or shrubland. In this series black willow can be a tree or a shrub depending on frequency or severity of disturbance, or the seral stage

of the site. Other trees occasionally found in the canopy include California sycamore, Fremont's cottonwood, white alder, and Oregon ash. Other shrubs that may be present in the black willow series include other species of willow, mulefat, Mexican elderberry, and Himalaya berry. The herb layer in black willow series can vary greatly depending on substrate conditions and site hydrology (Sawyer et al. 1996).

Black willow series is typically found at sites that are seasonally flooded or saturated with freshwater along low-gradient depositions along rivers, streams, or sloughs. Black willow series intergrades with tidal brackish and freshwater marsh habitats and with narrowleaf willow series, white alder series, and buttonbush series.

NARROWLEAF WILLOW SERIES: In the narrowleaf willow series narrowleaf willow is the sole or overwhelmingly dominant shrub in the canopy. Other trees or shrubs infrequently found in the canopy include other species of willow, Fremont's cottonwood, and white alder. The herb layer in narrowleaf willow series is usually sparse or absent because of the frequent scouring from flood events and the dense shade provided by the shrubs (Sawyer et al. 1996).

Narrowleaf willow series often occurs at sites along the margins of rivers that are continuously disturbed by sediment deposition. Older stands narrowleaf willow series are typically found on sites that are former sandbars that have been isolated from the main channel of a waterway either through channel migration or as a result of flood control. Narrowleaf willow series intergrades with tidal brackish and freshwater marsh habitats in some areas and with black willow series, white alder series, and buttonbush series.

WHITE ALDER SERIES: In the white alder series white alder is the sole or dominant tree in the canopy. Other trees that may be present include California sycamore, Oregon ash, or California box-elder. Depending on the level of flooding in this series the shrub layer can be dense to sparse. The ground, or herb, layer in white alder series can be variable, however, it is typically sparse in the Central Valley (Sawyer et al. 1996).

White alder series occurs along the banks of rivers typically in areas that experience high energy intermittent flooding. White alder series typically is best developed along the low-flow margins of rivers and streams. White alder series intergrades with black willow series, narrowleaf willow series, and valley oak series.

BUTTONBUSH SERIES: In the buttonbush series buttonbush is the dominant shrub in the canopy with occasional shrubs of red osier dogwood, narrowleaf willow, or other willows also present. Buttonbush series typically forms extensive dense canopies at the water's edge and typically has a sparse ground layer (Sawyer et al. 1996).

Buttonbush series occurs along intermittently flooded and seasonally saturated freshwater sites along rivers or sloughs. Buttonbush series intergrades with black willow series, narrowleaf willow series, and tidal brackish and freshwater marsh habitat plant communities.

MEXICAN ELDERBERRY SERIES: Mexican elderberry is often the dominant shrub in the canopy of Mexican elderberry series. Other shrubs that may occur in this series include California wild grape, narrowleaf willow, Oregon ash, and coyote brush. Occasional Fremont's cottonwood or valley oak trees may also be present. Mexican elderberry is a species that also frequently occurs in valley oak series. The ground layer in Mexican elderberry series is variable but often consists of non-native grasses and herbs (Sawyer et al. 1996).

Mexican elderberry series typically occurs on high floodplains or low terraces of rivers and streams. These sites experience infrequent flooding but do have seasonally high water tables. Mexican elderberry is the host plant for the Valley elderberry longhorn beetle, a federally listed threatened species. Mexican elderberry series intergrades with valley oak series and older stands of narrowleaf willow series that occur on abandoned floodplains.

VALLEY OAK SERIES: In Valley oak series valley oak is the sole or dominant tree in the canopy. In valley oak series that occurs on the high floodplains and low terraces of rivers other tree species that may be present include California sycamore, Fremont's cottonwood, and Oregon ash. The shrub layer in valley oak series is typically sparse. Common shrubs

include poison oak, Mexican elderberry, and occasional willows in wetter sites. Lianas of California wild grape growing into the canopy are common in this series. The ground layer in this series is typically grassy and is often dominated by native perennial grasses where extensive ground disturbance has not occurred.

Valley oak series typically occurs on the high floodplains and low terraces of rivers and streams. These sites are infrequently or frequently flooded for relatively short durations. Valley oak series intergrades with Mexican elderberry series and infrequently with older stands of narrowleaf willow series.

In general, tidal riparian vegetation is healthiest where ecosystem processes are in the most unaffected natural state. These unaffected sites are also the most resilient to human and natural disturbance. Ecosystem processes that are integral components of tidal riparian vegetation include sediment transport, deposition, and scour. These components support the succession and regeneration of riparian vegetation promoting its continued existence and ensuring continued habitat benefits for the aquatic environment. Riparian vegetation serves many important ecological functions. Riparian vegetation absorbs nutrients and produces primary (plant) and secondary (invertebrate) biomass at very high rates. This biomass feeds numerous fish and wildlife species. Birds and small mammals nest and take cover in the protective foliage of trees and shrubs. Trees also shade and cool floodplains and channels. Water velocities are slowed by riparian vegetation, allowing sediment to settle and create new landforms. Riparian foliage also stabilizes channels and banks, thereby rendering the characteristic geomorphology of estuaries, rivers, and streams.

Primary stressors affecting tidal riparian vegetation include:

- channel straightening and clearing
- levee construction and bank hardening to protect bridge abutments and diversion structures (e.g. with rip-rap);
- instream gravel mining and riparian zone grazing;
- flow modifications affecting sediment transport and riparian plant germination;
- removal, burning, and fragmentation of mature riparian vegetation; and
- loss of sediment and bedload from watershed sources upstream of dams.

Other stressors that affect tidal riparian vegetation include (listed in increasing importance and magnitude):

- human set fires along riparian corridors;
- new expansion of orchards and vineyards into the riparian floodplain;
- displacement by invasive non-native trees and shrubs (e.g. giant reed and black fig);
- unusually high summer stage in rivers that supply increasing demand for downstream water diversions;
- groundwater lowered below the root zone; and
- expanded clearing of channel vegetation in response to recent flood events that called into question the capacity of levee-confined rivers and streams.

Most stressors have an indirect but lasting effect on riparian vegetation. These stressors can affect the ability of riparian vegetation to recover following disturbance and can reduce the overall quality of the habitat. Collectively, these stressors have substantially reduced the quality and resilience of tidal riparian vegetation, thereby diminishing their effectiveness in providing for the life cycle requirements of fishes of the Delta and Sacramento and San Joaquin Rivers and their tributaries.

VISION

The vision for tidal riparian vegetation is to protect and increase its area and quality. Achieving this vision will assist in the recovery of special-status fish, wildlife, and plant populations and provide high-quality habitat for other fish, wildlife, and plants dependent on the Bay-Delta. The vision includes restoring native tidal riparian plant communities on both the less frequently flooded higher floodplain elevations and lower frequently flooded floodplain and streambanks.

The simple preservation of remaining natural riparian vegetation will not ensure the diversity, and resilience of these habitats. Many remnant natural sites no longer have all the physical processes necessary to ensure their continued existence and habitat value. Additionally, remaining natural riparian areas are in many cases highly fragmented and disturbed reducing their overall habitat value. Most riparian vegetation restoration projects in the Central Valley have been implemented on a relatively small scale, primarily as mitigation for project impacts or as infill of existing protected preserves.

Where natural physical processes are intact, or created through active land and water management, suitable conditions for the restoration (e.g. natural colonization or active restoration) of riparian vegetation will exist. Even partial restoration or simulation of natural physical processes will amplify ecosystem processes and resultant habitat quality. Rivers and Delta estuaries where natural fluvial processes and landforms are relatively intact need to be identified and highlighted as potential reserves of riparian vegetation.

Successful restoration of riparian vegetation depends on the recovery or simulation of natural fluvial processes and landforms. Revegetating and artificially altering stream channels will be considered only where overwhelming limitations prevent natural recovery of these physical processes and ecosystem functions.

INTEGRATION WITH OTHER RESTORATION PROGRAMS

Efforts to achieve the vision for tidal riparian habitat communities may involve coordination with other programs. These include:

- U.S. Army Corps of Engineers' proposed reevaluation of the Sacramento River flood control project and ongoing bank protection project, including more comprehensive floodplain management and river ecosystem restoration opportunities;
- proposed riparian habitat restoration and floodplain management and riparian restoration studies for the San Joaquin River, including potential new flood bypass systems and expanded river floodplains on lands recently acquired by State and federal agencies and land trusts;
- ongoing Sacramento Valley conservation planning by The Nature Conservancy and other private nonprofit conservation organizations;
- ongoing coordination efforts and programs of the Wildlife Conservation Board, including the Riparian Habitat Joint Venture;
- all county-sponsored instream mining and reclamation ordinances and river and stream management plans;
- and the California Department of Conservation reclamation planning assistance programs under the Surface Mining and Reclamation Act.

LINKAGE WITH OTHER ECOSYSTEM ELEMENTS

Tidal riparian vegetation is linked to the ecological health of many ERPP Ecological Management Zones and Units. This type of vegetation is important to many fish, wildlife, and plant species and communities. It is adversely affected by many stressors that include levee construction and maintenance, flood flow patterns, summer flow patterns, gravel mining, fragmentation of existing stands of vegetation, competition and displacement by invasive non-native species, land use conversion, flood control activities, and lowered groundwater levels.

OBJECTIVE, TARGETS, AND ACTIONS

The Strategic Objective is to enhance and/or conserve native biotic communities in the Bay-Delta estuary and its watershed.

SPECIES TARGETS: The target for all plant communities is to maintain the present distribution and abundance and ensure self-sustaining communities in the long-term.

LONG-TERM OBJECTIVES: Protect and restore, on a self-sustaining basis throughout the Delta, large blocks of tidal riparian habitat as a mosaic with other aquatic and wetland habitat types to a point where all at-risk species such as the valley elderberry longhorn

beetle, riparian brush rabbit, and yellow-billed cuckoo that depend on this habitat are no longer at risk.

SHORT-TERM OBJECTIVES: Conserve the best examples of riparian habitats in the Delta. Begin to restore large areas of tidal riparian habitat.

RATIONALE: Restoring tidal riparian habitat in combination with other aquatic, wetland, and upland habitat types will help restore and maintain the ecological health of aquatic, terrestrial, and plant resources in the Delta and other areas of the Central Valley. Foodweb processes will be supported and the effects of contaminants reduced. Tidal riparian habitat will provide high quality foraging and nesting habitat for migratory and wintering songbirds, neotropical migrants such as the Swainson's hawk, riparian brush rabbit, and yellow-billed cuckoo. Restoration of tidal riparian habitat will occur as a by product of restoring floodplain processes in a manner that improves spawning habitat for fish species such as splittail while avoiding concurrent increases in non-native predatory fish. Each habitat, including tidal riparian habitat, supports a different assemblage of organisms and quite likely many of the invertebrates and plants are still unrecognized as endemic forms. Thus systematic protection of examples of the entire array of habitats in the region provides some assurance that rare and unusual aquatic organisms will also be protected, preventing contentious endangered species listings.

STAGE 1 EXPECTATIONS: Several large tidal riparian habitat projects will have been initiated in the Delta. At least two of the projects will be associated with floodplain process restoration projects. At least two projects will be associated with restoring tidal riparian habitat in areas at the edges of the Delta where lands are not heavily subsided land elevations are appropriate to support actions to restore tidal riparian habitat.

RESTORATION ACTIONS

Recovery and simulation of natural physical processes and landforms will be accomplished using the following integrated steps:

- locating setback levees to expand potential riparian floodplain;
- expanding the storage, detention, and bypass capacity of the Sacramento and San Joaquin River flood control project to allow natural expansion of riparian vegetation within levees and the Sutter and Yolo Bypasses; and
- designating, acquiring title or easements for, and deliberately managing river riparian corridors throughout the Central Valley.

The following actions would restore or enhance sediment supply to rivers and streams:

- reduce bank hardening by creating meander zones and widening floodplains;
- analyze alternative approaches for water diversions and associated intake and screening facilities on the mainstem river to avoid hardening the bank in some sections of the river;
- remove small, nonessential dams on gravel-rich streams;
- eliminate mining in streams and on low floodplains near channels;
- widen bridges to broaden out-of-bank flow and eliminate the need to riprap vulnerable bridge abutments; and
- breach or remove nonessential levees restricting former tidelands that would capture sediment needed to create tidal mudflats and estuary landforms.

Opportunities for reducing riparian vegetation stressors include:

- phasing out instream gravel mining;
- designating and acquiring "stream erosion zones" to reduce the use of bank riprap and allow greater normal recolonization;
- designing biotechnical slope protection measures that allow riparian vegetation to be established within levees;
- phasing out or reducing livestock grazing in riparian zones;
- establishing conservation easements for purchase of land or using other incentives to reduce or eliminate cropland conversion or riparian forest;